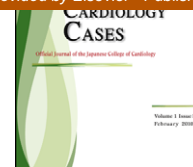




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## Case Report

# Successful surgical removal of long-term implantable cardioverter defibrillator lead infection caused by methicillin-resistant *Staphylococcus aureus* in patients with dilated cardiomyopathy

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## KEYWORDS

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**Summary** The patient was a 67-year-old male who received implantable cardioverter defibrillator (ICD) due to dilated cardiomyopathy and ventricular tachycardia 10 years previously. In September 2007, he was admitted to our hospital for dilated cardiomyopathy accompanied by congestive heart failure. Since he suffered from pneumonia and respiratory insufficiency, he was treated with steroid, long-term artificial respirator, and central venous catheter placement. Congestive heart failure and pneumonia improved; however, he was diagnosed as having ICD lead infection and infective endocarditis because of a positive blood culture for methicillin-resistant *Staphylococcus aureus* (MRSA). After 2 months of appropriate anti-MRSA agent administration, the ICD lead was surgically removed and his tricuspid valve was replaced. The postoperative course was uneventful; a cardiac resynchronization therapy defibrillator (CRT-D) was reimplanted 6 weeks after lead extraction. We experienced a case with long-term ICD lead infection and lead-related infective endocarditis in the tricuspid valve caused by MRSA in a patient with poor cardiac function, which is the first successful case in Japan.

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## Introduction

Recently, an increasing number of patients receive a pacemaker or an implantable cardioverter defibrillator (ICD) [1]. The incidence of lead infection is relatively low; how-

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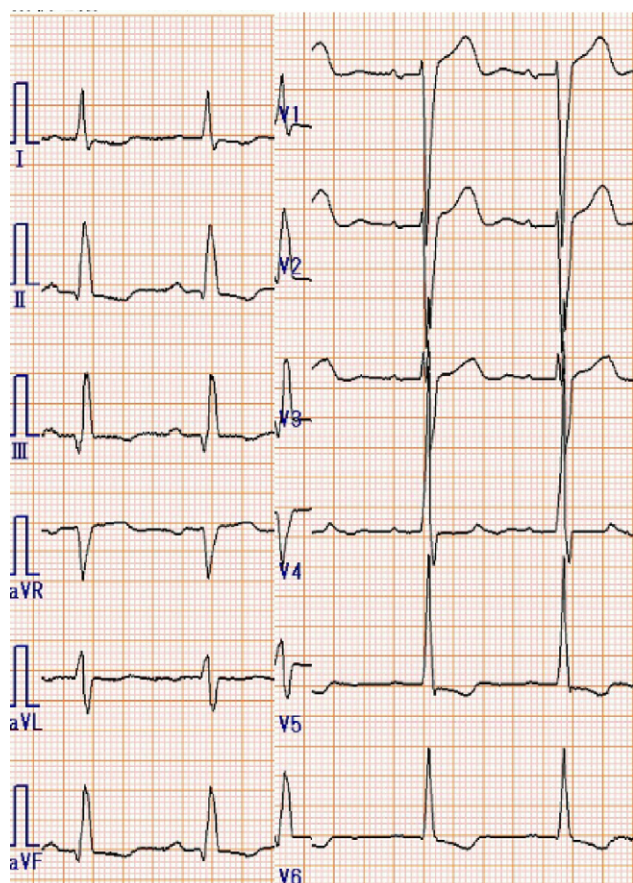


Figure 1 Electrocardiogram on admission.

ever, infection is a serious issue among the recipients. Antibiotics do not lead to general improvement; the most widely recommended approach is removal of an entire pacemaker or ICD. Direct traction is the preferred method, although, it is not adopted in a case with long-term lead infection. Most patients with ICD have poor cardiac function and the risks inherent in extraction. In this case, we report a dilated cardiomyopathy patient with ICD lead infection and infective endocarditis due to methicillin-resistant *Staphylococcus aureus* (MRSA) 10 years after implantation. This is the first case report in Japan, which demonstrates the successful surgical removal of long-term ICD lead infection caused by MRSA.

## Case report

The patient was a 67-year-old male who received ICD due to dilated cardiomyopathy and ventricular tachycardia 10 years previously. In September 2007, he presented with breathing difficulty due to congestive heart failure; he was immediately admitted to our hospital for detailed evaluation. On admission, the pulse was 140 bpm; blood pressure was 155/92 mmHg; body temperature was 36.7 °C; and oxygen saturation (SpO<sub>2</sub>) was 87%. The laboratory data showed leukocyte count of  $28,000 \times 10^9/L$ ; hemoglobin of 15.1 g/dl; platelets of  $205 \times 10^9/L$ ; creatine kinase of 137 U/L; C-reactive protein of 0.44 mg/dL; and brain natriuretic peptide (BNP) of 1212 pg/mL. Chest X-ray showed

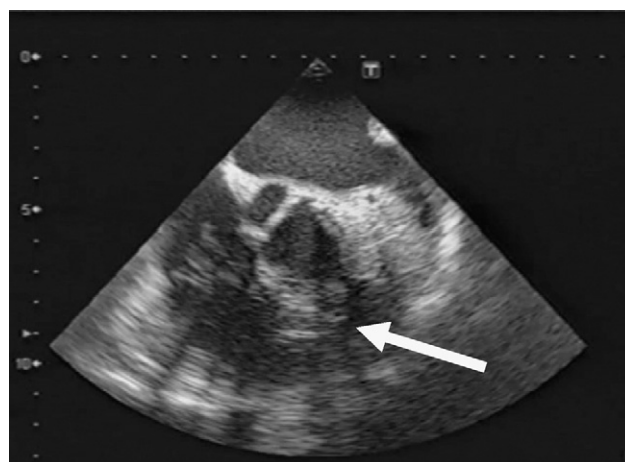
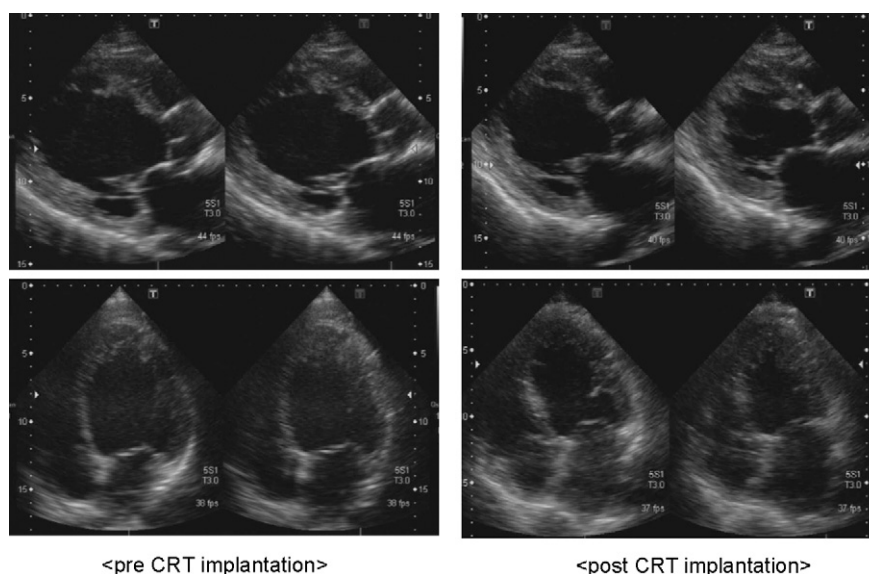


Figure 2 Transesophageal echocardiogram showing a 10 mm × 15 mm area of vegetation in the tricuspid valve in the right ventricle.

cardiomegaly (cardiothoracic ratio of 63%), lung congestion, and bilateral pleural effusion. Electrocardiography revealed a sinus rhythm of 80 bpm with complete left bundle branch block (Fig. 1). Since he suffered from pneumonia and respiratory insufficiency, he was treated with steroid, long-term artificial respirator, and central venous catheter placement. Congestive heart failure and pneumonia improved; however, he still had a fever with remarkable inflammatory response. He had a positive blood culture for MRSA; ICD lead infection was suspected. On the 40th hospital day, transesophageal echocardiography detected vegetation ranging from 10 to 15 mm in the tricuspid valve (Fig. 2). Two months of anti-MRSA agent administration reduced the inflammatory response; however, the blood culture was persistently positive. He was diagnosed as having ICD lead infection and infective endocarditis; the ICD lead was surgically removed and his tricuspid valve was replaced during extracorporeal circulation. Severe ICD lead adhesion included the upper part of the right atrium to the superior vena cava and the innominate vein. The inflammatory response was reduced; the blood culture became negative. MRSA was detected in the removed ICD lead and vegetation. Surgical removal was successful; however, he still had poor cardiac function [ejection fraction (EF): 17.7% assessed by Modified Simpson's method (Fig. 3); EF 22.0% assessed by M-mode, New York Heart Association (NYHA) classification grade III]. A cardiac resynchronization therapy defibrillator (CRT-D) was reimplanted 6 weeks after extraction. Echocardiography 1 week after reimplantation showed improvement in left ventricular systolic function (Fig. 3). No inflammatory response was observed; he was discharged 2 weeks after reimplantation.

## Discussion

Nowadays, the rate of cardiac device implantation is increasing [1]. Electrode lead endocarditis occurs in less than 1% of pacemaker and ICD implants; however, its mortality accounts for 33% [2]. Antibiotic therapy plays an important role, but lead infections are unlikely to be cured unless the device is removed [2,3]. Non-thoracotomy lead extraction can be performed within a few months after



**Figure 3** (Left) Echocardiogram before reimplantation. The left ventricular end-diastolic dimension was 68.8 mm; left ventricular end-systolic dimension was 63.3 mm; and ejection fraction 17.7%. (Right) Echocardiogram 1 month after reimplantation. Left ventricular systolic function significantly improved after CRT-D was implanted.

implantation, although, lead extraction remains difficult and may require an invasive surgical approach 1 year or more after implantation [4]. The mortality rate of surgical lead extraction is 17–40%, which is relatively high [2,5]. Our patient underwent cardioverter defibrillator implantation 10 years previously and had a vegetated tricuspid valve. In this case, we finally decided to perform lead extraction with extracorporeal circulation based on the following findings: (1) he responded well to appropriate antibiotic therapy; (2) he had no surgical risk except mild impaired respiratory and renal functions; and (3) one study previously reported that an aggressive operation with careful perioperative management had a good clinical result in an aged patient [6].

Timing of new device reimplantation after infected device extraction remains a matter of debate. Darouiche [7] suggested delaying reimplantation of a new device for up to 6 weeks in bacteremic patients; meanwhile, Sohail et al. [8] reported that a new device could be safely reimplanted once blood cultures were negative. In this case, we decided to reimplant 6 weeks after extraction, when the blood culture became negative, because the patient still had poor cardiac function (NYHA III), intraventricular dyssynchrony, and persistent ventricular tachycardia. The reimplanted device was upgraded to CRT-D. Yu et al. [9] proposed calculating a dyssynchrony index (Ts-SD) by using the standard deviation of 12 time intervals of the 6 basal and 6 mid myocardial segments. They demonstrated that left ventricular reverse remodelling after CRT could be predicted by  $Ts-SD \geq 31.4$  ms with a sensitivity of 96% and specificity of 78% in a single-center study. In the present case, we also used the Ts-SD before CRT-D reimplantation.

We encountered a patient with long-term ICD lead infection and infective endocarditis in the tricuspid valve due to MRSA. An aggressive operation with appropriate timing of lead extraction and careful perioperative management was required.

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